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CARE AND REPAIR OF FARM IMPLEMENT

No. 3

PLOWS AND HARROWS

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THIS bulletin, dealing with the care and repair of plows and harrows, is one of a series to be issued by the Department of Agriculture. Others of the series will deal with the care and repair of mowers, reapers, and binders, farm shop and equipment, farm shop practice, and other farm implements.

Thoughtlessness in the handling, care, and repair of farm machinery results annually in the loss of many thousands of dollars and much time to farmers. At this time every minute should be made productive of some result and every dollar should be saved.

This series is published to aid the farmer in preparing his machinery for the season's work at a period when he has time to do so and to minimize delays and loss of time in the field.

CARE AND REPAIR OF FARM IMPLEMENTS.

No. 3. PLOWS AND HARROWS.

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PLOWS.

PROBABLY no implement used on the farm receives a greater measure of abuse or as little attention to its proper care, operation, and repair as the plow. To quote a recent writer on machinery:

The plow is the basic tillage tool, the fundamental farm implement. It is not merely a tool for inverting the furrow slice, but it is the most efficient pulverizer of the soil in use. As the moldboard turns the furrow, each particle of soil is forced to slip against the particle adjoining, a process which results in a tilth that no other single operation approaches. The general impression prevails that the plow is a simple tool, requiring but little adjustment and less care. This is far from the truth, however. Without question it is the most complex tool on the farm, in that it requires the greatest skill for adjustments, the grain-binder and the gasoline engine not excepted. More effort has been expended in the slow process of development of this seemingly simple tool than in that of any other implement on the farm. Careful study of its construction, adjustment, and use will be amply rewarded.

This useful implement should not be allowed to remain in out-of-the-way places subject to deterioration by weather conditions, but should be housed properly when not in use. When laid by, it should be stored in a dry place away from contact with the ground and the bright parts coated with grease to prevent rust. Once the moldboard share and landside have become pitted with rust an efficient job of plowing can not be done until the corroded parts again have acquired a polish by use. In overhauling, the following scheme is suggested:

HAND PLOWS.

REPAIRS.

FLATLAND PLOWS.

Share.—If chilled cast iron and badly worn, renew. If steel and badly worn, should be sharpened, bearing at wing $\frac{3}{4}$ inch for 10-inch bottom to $1\frac{1}{4}$ inches for

16-inch bottom; vertical suction, $\frac{1}{8}$ inch; horizontal suction, $\frac{1}{8}$ to $\frac{1}{4}$ inch, as shown by figure 1.

Landside.—If badly worn and detachable sole is provided, replace sole, otherwise it will be necessary to renew landside.

Moldboard.—Usually in two parts, shin and moldboard proper. If shin be present and badly worn, renew. See that moldboard is bolted tight to frog.

Bracing.—If loose, tighten up connections.

Handles.—If loose, tighten up bolts so that they are attached rigidly to bottom and see that bracing is tight.

Beam.—If loose, see that bolts to frog are tight.

Gauge wheel.—Examine bearings and if badly worn replace with new. If plain bearings, do not lubricate. See that gauge-wheel standard is bolted rigidly to beam.

Jointer.—Examine point, if badly worn and if chilled cast iron, renew; if steel, it may be sharpened. See that it is bolted rigidly to the beam.

Rolling coulter.—Seldom used on hand plows but if present examine the coulter-wheel bearing and if badly worn, renew. See that the standard is attached rigidly to the beam.

Fin or hanging coulter.—Should be attached rigidly to the beam and sharpened if worn.

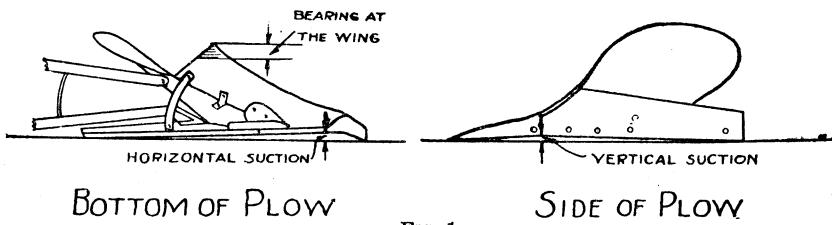


FIG. 1.

HILLSIDE PLOWS.

In addition to points considered in connection with flatland plows, examine hillside plows for the following:

Swivel joints.—These should work freely, but have little lost motion. If adjustment be provided for, take up lost motion; otherwise renew bearings.

Latch.—Should catch and hold moldboard tightly against standard.

Jointer.—Should reverse automatically when moldboard is swiveled. If it reverse too far in one direction and not enough in the other, adjust to mid-position.

Clevis shifting lever.—See that this lever latches properly in required positions.

Suction.—Some hillside plows are equipped with shoe on the landside by means of which vertical suction may be regulated.

ADJUSTMENTS.

Depth of furrow.—Made by raising or lowering the clevis or bridle on end of beam. This also may be regulated slightly by the gauge wheel where wide and frequent variations in soil conditions prevail. The gauge wheel should not be used where the soil conditions are uniform, except in very stony soil, as it increases the draft of the plow. In any case, there should not be excessive

bearing pressure on the gauge wheel, the function of this wheel being to prevent plowing at a greater than the desired depth when passing from a firm and hard soil to one of more friable nature.

Width of furrow.—Made by shifting the hitch on the clevis or bridle to or from land according to whether a greater or less width of furrow slice is desired. In using more than two horses this also may be regulated to some extent by the gauge wheel if this wheel has a standard which may be adjusted to lead wheel to or from land.

Handles.—Should be adjusted to suit height of the operator.

Jointer.—Should be set so that its point is just above or just back of the point of the share, to run $1\frac{1}{2}$ to 2 inches deep and slightly to the landside of the shin of the plow.

Coulter.—If used, it should be set in a position similar to the jointer except that it should run about half the depth of the furrow. A rolling coulter does not, however, take the place of a jointer. The functions of the two attachments differ in that the function of the jointer is to turn under a small furrow slice ahead of the furrow proper, so that a smoother job of plowing results, and that of the rolling coulter to cut tough grass roots and surface trash, so that they may be covered more efficiently by the furrow slice.

Hitch.—The theoretical line of draft originates at a point about 2 inches from the moldboard side of the shin, just above the junction of the shin and moldboard. This line should pass through the hitch at the beam clevis and end at a point midway between the short tug rings at the hames. Any variation from this line will influence the plowing, such as too short or too long traces, short hip straps, etc. If this line be straight and the reins adjusted properly, the plow properly set for depth and width required, no effort of the operator is needed in guiding, except to steady the plow in a proper running position when obstacles are encountered.

SULKY AND GANG PLOWS.

REPAIRS.

Wheel bearings.—Take down, clean with cloths saturated with kerosene oil, make adjustments for wear if provided for, and repack with heavy grease before assembling.

Frame.—Examine for loose bolts and connections and take them up.

Landing and lifting levers.—See that all connections are tight and take up lost motion if possible.

Beam and frog.—Examine for loose bolts and connections and tighten if present.

Share.—If worn, replace or sharpen.

Landside.—If worn and has a removable sole, replace the sole, otherwise replace the landside.

Coulter.—Rolling coulter usually is used. Examine the bearings and renew if necessary. See that the coulter standard is attached rigidly to the beam.

ADJUSTMENTS.

Depth.—Regulated by raising or lowering the bottom in relation to the frame. Suction as applied to sulky or gang plows is the distance of the back end of the landside from the floor with the point and wing of the share resting on the floor. This is about one-half inch for most plows, though it may vary for different lengths of landsides.

Width.—Regulated by adjusting the hitch to or from land on the frame. It may be regulated also to some extent by "landing" the front furrow wheel.

Jointer.—If used, it should be set so that its point is just above and just back of the point of the share, to run $1\frac{1}{2}$ to 2 inches deep and slightly to the landside of the shin of the plow.

Coulter.—Should be set half the depth of the furrow, back of the point of the share and slightly to the landside of the shin. If used in connection with a jointer, it should be set ahead of it.

Wheels.—The land wheel should travel directly to the front of and parallel with the furrows. The front furrow wheel is given a small lead from the land, likewise the rear furrow wheel. The rear furrow wheel should run 1 to 2 inches outside of the landside of the plow.

Hitch.—In any wheel plow the load should be carried on the wheels as much as possible to reduce the draft. The driver may test this by dismounting while the plow is under way and taking hold of the frame at the front wheel and sliding it sidewise, and doing likewise at the rear furrow wheel. If equal resistance to side motion be encountered, it is reasonable to assume that all the load is carried on the wheels. The load may be equalized by raising the point of the hitch or lengthening the traces.

DISC PLOWS.

The general features of disc plows are the same as in other plows except that the bottoms are replaced by discs.

REPAIRS.

Refer to sulky and gang plows and examine:

Disc bearings.—Take down, clean with kerosene, replace the worn parts, and assemble with sufficient grease to pack the bearings properly.

Discs.—Sharpen or replace if badly worn.

Scrapers.—See that all connections are tight and if the scrapers are badly worn, renew them.

ADJUSTMENTS.

Depth of cut.—Is regulated by raising or lowering the frame, to which the discs are attached, on the staff bearings of the front and rear furrow wheels and land wheel.

Width of cut.—Is regulated by landing the front and rear furrow wheels and setting the scrapers for a wide or narrow furrow.

Wheels.—The land wheels should travel directly to the front and parallel with the furrow. The front furrow wheel is given a small lead from the land, likewise the rear furrow wheel, which should run 1 to 2 inches outside of the land side of the furrow.

Hitch.—In any disc plow, loads should be carried on the wheels as much as possible to reduce draft. The load may be equalized by raising the point of the hitch or lengthening the traces.

HARROWS.

As the plow is the basic tillage tool, it follows that the harrow plays the next most important part in the preparation of the soil for the seed. From the first harrow employed, the old-time wooden

"A" frame drag with square teeth, have developed the three classes, spike-tooth, spring-tooth, and disc harrows, now mainly used.

The care and repair of these implements will be discussed in the order mentioned.

SPIKE-TOOTH HARROWS.

In overhauling, the following procedure is suggested:

Frames.—Examine in detail to see that all frame bolts are tight. Bent or distorted frames should be restored to their original shape. Broken or bent frame bracing should be replaced or restored to its original shape and broken connections replaced.

Teeth.—If worn on one side only, should be reversed in the clamps. If dull and blunted, they should be removed and resharpened by forging and retempering. When replacing teeth, support the frame equally all round on a floor or flat surface and set teeth to a uniform depth. See that all clamps are drawn up tight, but not so tight that threads are stripped or bolts stressed to the breaking point. All lock nuts and cotter keys should be in place, and broken or bent bars replaced or straightened. Wooden tooth bars should be scraped clean of earthy accumulations, brushed, and painted.

Lever connections.—Examine lever connections to see that they work freely and latch positively. Straighten bent levers and put cotter keys in lever connections in place. Renew any broken or badly worn parts.

Draft connections.—The drawbar, if of metal and bent, should be straightened and also the bails. If drawbar and bails are bent the teeth will track, and good work can not be obtained. Toggle bolts and links, if badly worn, should be renewed and all nuts drawn up tight.

Storage.—Many farmers who would not neglect an expensive harvesting machine are careless in the care of harrows and other implements of this type. These also represent capital invested, and a larger return is possible if they be properly cared for and housed at the end of the season. If stored under a shed the teeth should be supported by blocks or boards so they will not become embedded in the ground. All accumulations of earth and trash should be removed. Especially is this true of wooden frame harrows. The earthy accumulations retain moisture and accelerate decay of these parts. If these parts have dried out sufficiently they may be painted, which will prevent season checking and splitting. As the harrow works in wet earth close to the ground, once checking has started the deterioration is rapid, especially at those points where metal and wood come into contact. Aside from prolonging its usefulness and adding to its appearance, a well-cared-for implement which retains some of the appearance of newness commands more respect and is subject to less abuse from the operator than one which has the general atmosphere of decrepitude.

SPRING-TOOTH HARROWS.

Spring-tooth harrows differ from spike-tooth harrows in that the short, straight, rectangular steel-spike tooth is replaced by a flat piece of spring steel, conforming more or less throughout its length to the arc of a circle and having a flat point forged on one end or equipped with a reversible point. Special teeth with round points are also made for harrowing alfalfa fields. The spring-tooth harrow

finds its widest use in those sections where deep cultivation is desired and stony land abounds.

Much that has been said about spike-tooth harrows applies to the spring-tooth type as well. Such headings as differ and have not been touched upon in the foregoing outline follow:

Teeth.—Teeth, when dull, should be sharpened unless equipped with reversible points. In sharpening by forging, the original form of point and temper should be maintained.

Shoes.—Some makes of harrows have individual shoes at the junction of the harrow tooth and frame to prevent wear of the tooth at this point. If worn, these should be renewed.

Wheels.—Some makes of harrows carry the weight of the frame and teeth on wheels with or without a riding seat. For such harrows, examine wheel boxes and bearings and renew badly worn parts. Examine seat fastenings to see that all connections are rigid and tight.

Riding attachments.—Riding attachments have come into use in later years. These add little to the draft and make available for this work labor which otherwise could not be used. Plodding behind a harrow on soft ground is hard work and requires a sturdy constitution, especially if there is any considerable acreage to be cultivated. These attachments are used with spike-tooth harrows also. In overhauling, examine seat and frame connections to see that they are rigid and tight, and also the wheel bearings, replacing any parts worn or weakened by wear.

DISC HARROWS.

Disc harrows are used both before and after plowing. The advantages claimed for use before plowing are that surface trash is cut up so that it is covered more efficiently by the furrow slice, and that the top soil is pulverized so that less draft is required in plowing, also that this pulverized soil is turned into the bottom of the furrow, so that the soil particles lie close and in more intimate contact and better retain moisture. This harrow is used in both single and double disc gangs. The advantages claimed for the double-disc gang is that it both pulverizes and levels the ground in one operation, the front gangs being set to throw the soil out, the rear to throw the soil in. The rear gang also has an opportunity to break up the clods while they are still soft when stirred up by the front gang. This assists in preventing moisture evaporation. In overhauling disc harrows the following procedure is suggested:

Main frame.—Examine frame connections to see that all bolts are tight and that gang bearings and frame bracing are attached rigidly. Bent or broken frame bracing should be straightened or replaced.

Gang bearings.—Examine and wash out grease and dirt with coal oil or gasoline and wipe dry. Worn parts should be renewed. Unless they are dust tight, bearings on disc harrows show wear more quickly than any other part. If wood bushings are used, a supply should be on hand to replace those worn, as they are inexpensive. See that oil pipes are cleaned out and that grease or oil gets down into the bearings. If grease cups are used, see that they are

screwed down sufficiently to insure a supply of grease in the bearings. In replacing, pack bearings with grease. If this is not done, it will be necessary to fill the grease cups and screw them down two or three times to insure proper packing of the bearing.

Discs.—Discs should be sharpened if dull so that they cut trash and penetrate the ground readily.

Disc gangs.—See that the discs are tight on gang bolts. If they are not, the discs will wobble and good work will not result.

Bumpers.—When disc gangs are set at an angle for discing see that bumpers come in contact with each other and carry all end thrust off the boxes and bearings, thus prolonging their life.

Scrapers.—Examine scrapers and replace any badly worn. See that all bear equally on the discs. If any are too close, they will cause friction and wear; if too far away, they will not clean discs properly.

Snubbing blocks.—Examine to see that they are adjusted to keep gangs running level when in use. If gangs are cutting too deep in the center, raise the snubbing blocks, so the gangs will run level. If gangs are running too high in the center, lower the snubbing blocks.

Levers and quadrants.—See that levers work freely and positively and that all attachments are bolted securely to the stub tongue bracket. Worn or broken parts should be replaced.

Seat and draft connections.—See that all fastenings are tight. A seat insecurely fastened may cause trouble if double gang is used. Draft connections, if badly worn, should be renewed.

Adjustments.—There are few adjustments to make on a disc harrow in the field. Depth of penetration is secured by angling the discs according to the hardness of the soil. When lapping, the gang that is working the ground previously disced should be set at a greater angle than the one working the undisced land. The harrow will run straight and side draft will be eliminated. When discing on side hills the gang on the uphill side should be set at the greater angle so that the tendency to work downhill will be overcome. On wet soil the scrapers should be used frequently to prevent clogging of the discs. If a tongue truck is used it should be adjustable for different heights of team and different depths of discing so that the truck is not forced into the ground, thus increasing the draft.

Storage.—At the close of the season or when the disc harrow is not in use, if stored under a shed, the disc gangs should be run upon boards so the discs may not become embedded in the ground. The implement should be cleaned carefully of all accumulations of soil, and discs greased with a heavy grease to prevent rust. The protective covering of paint should be renewed at the proper time. Especially is this true of the wooden parts.

Transporting.—When transported long distances disc harrows should be carried in a wagon or other vehicle. Transport trucks, wheels, rollers, or other means should be provided for moving a disc harrow over roadways about the farm. A plank float may be used for this purpose.

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